

REMARKS

This paper is responsive to the non-final Office Action dated June 7, 2004. Claims 1 - 6 are pending in this application and have been rejected. Applicant respectfully traverses the rejections and requests reexamination based upon the following remarks and new claims 7 - 18.

Comparison of Applicant's Figure 1 and Figure 5 of '420

Applicant transmits S-polarized light from separating surface (51) to DMD (70) and reflects this light through quarter wave plate (60) thereby converting S-polarized light to P-polarized light. P-polarized light is then transmitted to projector (80). In '420, the same process occurs where S-polarized light is transmitted to a DMD, such as DMD (158). Light reflected from DMD (158) is then transformed to P-polarized light at quarter wave plate (157) and passes back in the direction of the separating surface (130). In this area of the devices (Figure 5 or Applicant's Figure 1), the operation by converting S-polarized light to P-polarized light through the quarter wave plate and the DMD is the same.

However, Figure 5 (and also Figure 1) of '420 differs from Applicant's Figure 1 and also Applicant's claim 1 in that Figure 5 does not include a polarization converter, such as Applicant's polarization converter (30). Instead, as shown in Figure 5 '420 uses a polarization beam splitter which reflects S-polarized light in the direction of DMD. This action of the PBS provides

for transmission of S-polarized light in the direction of (158) and P-polarized light in the direction of (168).

On the other hand, Applicant transmits only S-polarized light to the claimed separating surface. '420, on the other hand, provides non-polarized light as an input to the PBS (130). It is only within the PBS (130) that p-polarized light and S-polarized light are separated.

The difference between '420 and Applicant's specification and drawings is that Applicant includes a polarization converter (30) to provide only S-polarized light to the separating means and '420 provides non-polarized light to the PBS.

Applicant's utilization of a polarization converter or comb filter (30) has the effect to prevent the quantity of light incident on the DMD by one half. By arranging a luminous flux to one polarization light through the polarization converter (30), all the luminous fluxes as an arranged light (S-polarized light) are deflected to the DMD (70) at the polarization separating surface (51) efficiently without losing its quantity.

F-Number Problem

The '420 patent simply does not at all address the F-number problem discussed in Applicant's specification. For purposes of clarification, it is requested that the Examiner consider the following discussion.

With respect to the problem of F-number, in case of a total reflection prism shown in Figure 6 of the application, an

incident light with some angle would be reflected but an incident light with another angle would not be reflected. The conventional TIR prism shown in Figure 6 is restricted with respect to the angle of this incident light. That is, there has been difficulty to make a bright illumination optical system with arranging F number arbitrarily (see paragraph [0056] of specification). In the invention, since the surface (51) of the prism (50) is a polarization separating surface and has no restriction of incident angle, the angle of incident light is sent up arbitrarily so as to make θ bigger of $F_{no.} = 1/(2 \cdot n \cdot \sin\theta)$. In the conventional TIR prism, the surface is made of air-gap, it is restricted to design arbitrarily so as to make F number smaller since the surface made of air-gap is restricted with respect to this incident angle.

Though the polarization separating surface of the polarization beam splitter (130) in the reference '420 also functions as a polarization combining surface, however, the polarization separating surface (51) of the invention is neither the polarization separating surface which separates two luminous fluxes nor the polarization combining surface which combines two luminous fluxes. The polarization separating surface of the invention is that deflects the incident light and transmits the output light. In the invention, one polarization separating surface corresponds to one DMD, that is an illumination luminous flux is not separated into R, G, B components. If we used the polarization separating surface of the invention for R, G, B

components shown in the reference '420, individual DMD would be needed for all the polarization separating surfaces, respectively.

Claim 1

Applicant's claim 1 as originally presented clearly defines over '420. Applicant states as follows:

an illumination optical system for illuminating the digital micromirror device with a luminous flux having a uniform polarization direction

Applicant respectfully submits that although light is transmitted to DMD (158) in '420 in a uniform polarization direction, it does not originate at an illumination optical system in the manner claimed in claim 1. This is clear for the fact that Applicant's claim 1 further states as follows:

luminous flux separating means for making light from the illumination optical system incident on the digital micromirror device . . .

This statement separates the luminous flux separating means from the illumination optical system. As stated in the description of the illumination optical system, it is the illumination optical system which provides the uniform polarization direction. In

'420 it is the luminous flux separating means and not the illumination optical system which provides the S-polarized light to the DMD (158). It is, therefore, clear that claim 1 does not read upon '420 because '420 does not provide a polarized light to the polarization beam splitter (130).

Applicant has claimed a "luminous flux separating means". In accordance with interpretation of claims having means plus function terminology, the language of the claim must not be read in a manner broader than the apparatus disclosed. Here, the luminous flux separating means is required to make light from the illumination optical incident on the micromirror device. This statement of its function clearly illuminates any function in the separating means of separating P-polarized and S-polarized light in the luminous flux separating means as does '420.

Claim 4

Claim 4 has been rejected under 35 USC § 103(a) as being unpatentable over '420. Therefore, the rejection of claim 4 is also traversed.

Claim 5

Claim 5 provides additional definition over claim 1. Claim 1 does not specify the type of uniform polarization direction of the light from the illumination optical system. Applicant's figures and description show that the light from the illumination optical system is preferred to be S-polarized. This is more

specifically claimed in claim 5, therefore, light from the illumination optical system may be P-polarized as described by Applicant at paragraph [0051] of this specification.

New Claims 7 - 12

New claims 7 - 12 have been drafted to utilize the word "device" instead of "means". The purpose of this amendment is to avoid future narrow construction of Applicant's claims due to court imposed limitations on means + function format claims.

New Claims 13 - 18

Claims 13 - 18 are similar to original claims 1 - 6, except that these claims in the last clause (claim 13) refer to a polarization direction arranging rather than polarization direction rotating. Clearly, in the broad sense, it is polarization arrangement occurring at the input of the quarter-wave plate (60) and the output of the quarter-wave plate (60) which allows for separation for passing of light at surface (51) of Applicant's polarization separating prism (50) shown in Figure 1. In Applicant's specification, the concept of conversion of P-polarized light into S-polarized light to thereby arrange the illumination light from a light source is found in paragraph [0032]. It is respectfully submitted that the invention depicted in Figures 1 - 5 clearly depicts arranging of the light in order to be reflected from or transmitted through the surface (51).

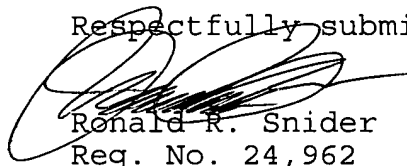
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In view of the foregoing, it is respectfully submitted that the application is now in condition for allowance, and early action in accordance thereof is requested. In the event there is any reason why the application cannot be allowed in this current condition, it is respectfully requested that the Examiner contact the undersigned at the number listed below to resolve any problems by Interview or Examiner's Amendment.

Respectfully submitted,



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